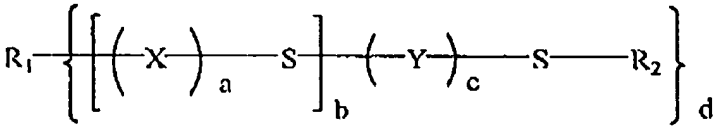
RD29532-5

IN THE CLAIMS

1. (Original) A method for producing a catalyst composition which catalyzes the formation of bisphenols from aromatic hydroxy compounds and carbonyl containing compounds, said method comprising the step of attaching a poly-sulfur mercaptan promoter component to a solid acid support component comprising a protic acid functionality, said poly-sulfur mercaptan promoter component having the following structure (I),



(I)

wherein R1 is an imidazole functionality;

wherein a is between about 0 and about 11;

wherein b is between about 1 and about 11;

wherein c is between about 1 and about 11;

wherein d is between about 1 and about 5;

wherein X is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms;

wherein Y is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms; and

wherein R2 is one member selected from the group consisting of a hydrogen, a secondary aliphatic functionality, a tertiary aliphatic functionality, an ester functionality, a carbonate functionality, and a benzyl functionality which is attached via the benzylic methylene carbon.

2. (Original) The method of claim 1, wherein said tertiary aliphatic functionality is one member selected from the group consisting of a branched aliphatic functionality, and a cyclic aliphatic functionality.

3. (Original) The method of claim 1, wherein said R_2 functionality is one member selected from the group consisting of an isopropyl functionality, an isobutyl functionality, a tertiary butyl functionality, a tertiary amyl functionality, a cyclopentyl functionality, a benzyl, a 4-methoxybenzyl functionality, a 1-methylcyclohexyl functionality, and a cyclohexyl functionality.

4. (Original) The method of claim 1, wherein said ester functionality is one member selected from the group consisting of an acetate functionality, a propionate functionality, and a benzoate functionality.

5. (Original) The method of claim 1, wherein said carbonate functionality is one member selected from the group consisting of an alkyl carbonate functionality, and an aromatic carbonate functionality.

6. (Original) The method of claim 1, wherein the bisphenol which is being formed is 4,4'-isopropylidenediphenol.

7. (Original) The method of claim 1, wherein the carbonyl containing compound is a ketone or an aldehyde.

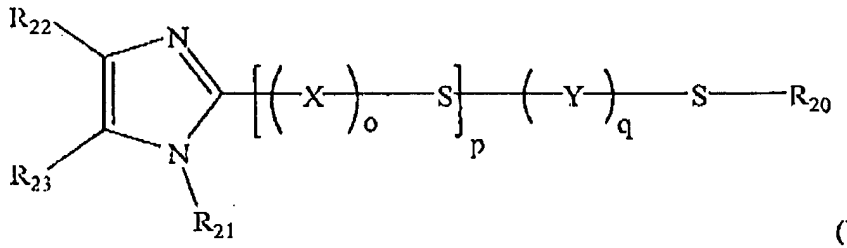
8. (Original) The method of claim 1, wherein the aromatic hydroxy compound is phenol, and the carbonyl containing compound is acetone.

9. (Original) The method of claim 1, wherein the attachment step is performed in an aqueous solution comprising water.

10. (Original) The method of claim 1, wherein said solid acid comprises at least one member selected from the group consisting of polystyrene, a zeolite, and silica.

11. (Original) A method for producing a catalyst composition which catalyzes the formation of bisphenols from aromatic hydroxy compounds and carbonyl containing compounds, said method comprising the step of attaching a poly-sulfur mercaptan promoter component to a polymeric resin component comprising a protic acid functionality, wherein said poly-sulfur mercaptan promoter component is a functionalized imidazole mercaptan.

12. (Previously Presented) The method of claim 11, wherein said functionalized imidazole mercaptan has the structure (V),



(V)

wherein o is between about 0 and about 11;

wherein p is between about 1 and about 11;

wherein q is between about 1 and about 11;

wherein X is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms;

wherein Y is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at

least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms;

wherein R_{20} is a hydrogen atom or a sulfur-protecting functionality which is one member selected from the group consisting of an aliphatic functionality comprising at least about 4 carbon atom, an ester functionality comprising between about 1 and about 11 carbon atoms, a carbonate functionality comprising between about 1 and about 11 carbon atoms, and a benzylic functionality comprising at least about 7 carbon atoms which is attached to the terminal sulfur atom via the benzylic methylene carbon;

wherein R_{21} is one member selected from the group consisting of a hydrogen, an aliphatic carbonyl functionality comprising about 1 to about 11 carbon atoms, an aliphatic functionality comprising between about 1 and about 11 carbon atoms, an aromatic carbonyl functionality comprising at least about 7 carbon atoms, and an aromatic functionality comprising at least about 6 carbon atoms; and

wherein each of R_{22} and R_{23} are independently one member selected from the group consisting of a hydrogen, a fluoride, a bromide, a chloride, an iodide, a vinyl group, a hydroxide, an alkoxide functionality comprising between about 1 and about 11 carbon atoms, an aryloxide functionality comprising at least about 6 carbon atoms, an aliphatic functionality comprising between about 1 and about 11 carbon atoms, an aromatic functionality comprising at least about 6 carbon atoms, a cycloaliphatic ring comprising at least about 5 carbon atoms, said cycloaliphatic ring being fused to the imidazole ring through an adjacent ring substituent, and a cycloaromatic ring comprising at least about 6 carbon atoms, said cycloaromatic ring being fused to the imidazole ring through an adjacent ring substituent.

13. (Original) The method of claim 11, wherein the bisphenol which is being formed is 4,4'-isopropylidenediphenol.

14. (Original) The method of claim 11, wherein the carbonyl containing compound is a ketone or an aldehyde.

15. (Original) The method of claim 11, wherein the aromatic hydroxy compound is phenol, and the carbonyl containing compound is acetone.

16. (Original) The method of claim 11, wherein the attachment step is performed in an aqueous solution comprising water.

17. (Original) The method of claim 11, wherein said polymeric resin comprises at least one member selected from the group consisting of polystyrene, a zeolite, and silica.

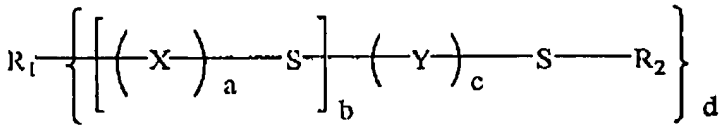
18. (Original) The method of claim 17, wherein said polymeric resin further comprises divinylbenzene.

19. (Original) The method of claim 18, wherein the amount of divinylbenzene is up to about 12 percent of the total weight of the polymeric resin.

20. (Original) The method of claim 11, wherein said protic acid functionality comprises at least one member selected from the group consisting of a sulfonic acid functionality, a phosphonic acid functionality, and a carboxylic acid functionality.

21. (Original) The method of claim 12, wherein the linking functionality X, is the same as the linking functionality Y.

22. (Original) A method for forming bisphenols, comprising the step of reacting an aromatic hydroxy compound with a carbonyl containing compound in the presence of a catalyst composition, said catalyst composition comprising a solid acid component and a poly-sulfur mercaptan promoter component having the following structure (I),



(I)

wherein R1 is an imidazole functionality;

wherein a is between about 0 and about 11;

wherein b is between about 1 and about 11;

wherein c is between about 1 and about 11;

wherein d is between about 1 and about 5;

wherein X is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms;

wherein Y is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms; and

wherein R2 is one member selected from the group consisting of a hydrogen, a secondary aliphatic functionality, a tertiary aliphatic functionality, an ester functionality, a carbonate functionality, and a benzyl functionality which is attached via the benzylic methylene carbon.

23. (Original) The method of claim 22, wherein said tertiary aliphatic functionality is one member selected from the group consisting of a branched aliphatic functionality, and a cyclic aliphatic functionality.

24. (Original) The method of claim 22, wherein said R_2 is one member selected from the group consisting of a, an isopropyl functionality, an isobutyl functionality, a tertiary butyl functionality, a tertiary amyl functionality, a cyclopentyl functionality, a benzyl, a 4-methoxybenzyl, a 1-methylcyclohexyl functionality, and a cyclohexyl functionality.

25. (Original) The method of claim 22, wherein said ester functionality is one member selected from the group consisting of an acetate functionality, a propionate functionality, and a benzoate functionality.

26. (Original) The method of claim 22, wherein said carbonate functionality is one member selected from the group consisting of an alkyl carbonate functionality, and an aromatic carbonate functionality.

27. (Original) The method of claim 22, wherein the bisphenol which is being formed is 4,4'-isopropylidenediphenol.

28. (Original) The method of claim 22 wherein the aromatic hydroxy compound is phenol.

29. (Original) The method of claim 22, wherein the carbonyl containing compound is a ketone or an aldehyde.

30. (Original) The method of claim 29 wherein the ketone is acetone.

31. (Original) The method of claim 22, wherein said solid acid comprises at least one member selected from the group consisting of polystyrene, a zeolite, and silica.

32. (Original) The method of claim 22 wherein said solid acid is a sulfonic acid functionalized polymeric resin.

33. (Original) The method of claim 32, wherein said polymeric resin further comprises divinylbenzene.

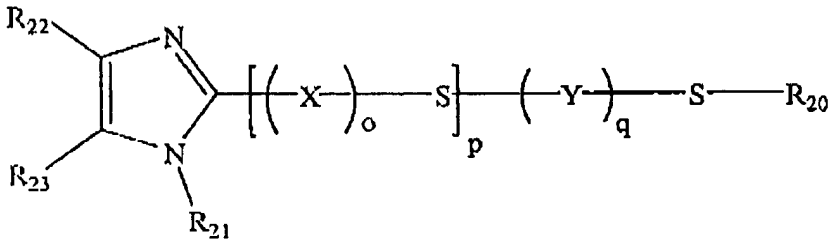
34. (Original) The method of claim 33, wherein the amount of divinylbenzene is up to about 12 percent of the total weight of the polymeric resin.

35. (Original) The method of claim 22 wherein said solid acid component comprises at least one member selected from the group consisting of a sulfonic acid functionality, a phosphonic acid functionality, and a carboxylic acid functionality.

36. (Original) The method of claim 22, wherein the linking functionality X, is the same as the linking functionality Y.

37. (Original) A method for forming bisphenols, comprising the step of reacting an aromatic hydroxy compound with a carbonyl containing compound in the presence of a catalyst composition, said catalyst composition comprising a polymeric resin component comprising a protic acid functionality, and a poly-sulfur mercaptan promoter component, wherein said poly-sulfur mercaptan promoter component is a functionalized imidazole mercaptan.

38. (Previously Presented) The method of claim 37, wherein said functionalized imidazole mercaptan has the structure (V),



(V)

wherein o is between about 0 and about 11;

wherein p is between about 1 and about 11;

wherein q is between about 1 and about 11;

wherein X is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms;

wherein Y is a linking functionality which is one member selected from the group consisting of a linear aliphatic chain comprising between about 1 and about 11 carbon atoms, a cyclic aliphatic ring comprising at least 5 carbon atoms, a cyclic aromatic ring comprising at

least 6 carbon atoms, a cyclic aliphatic heterocycle comprising at least 3 carbon atoms, and a cyclic aromatic heterocycle comprising at least 3 carbon atoms;

wherein R_{20} is a hydrogen atom or a sulfur-protecting functionality which is one member selected from the group consisting of an aliphatic functionality comprising at least about 4 carbon atom, an ester functionality comprising between about 1 and about 11 carbon atoms, a carbonate functionality comprising between about 1 and about 11 carbon atoms, and a benzylic functionality comprising at least about 7 carbon atoms which is attached to the terminal sulfur atom via the benzylic methylene carbon;

wherein R_{21} is one member selected from the group consisting of a hydrogen, an aliphatic carbonyl functionality comprising about 1 to about 11 carbon atoms, an aliphatic functionality comprising between about 1 and about 11 carbon atoms, an aromatic carbonyl functionality comprising at least about 7 carbon atoms, and an aromatic functionality comprising at least about 6 carbon atoms; and

wherein each of R_{22} and R_{23} are independently one member selected from the group consisting of a hydrogen, a fluoride, a bromide, a chloride, an iodide, a vinyl group, a hydroxide, an alkoxide functionality comprising between about 1 and about 11 carbon atoms, an aryloxide functionality comprising at least about 6 carbon atoms, an aliphatic functionality comprising between about 1 and about 11 carbon atoms, an aromatic functionality comprising at least about 6 carbon atoms, a cycloaliphatic ring comprising at least about 5 carbon atoms, said cycloaliphatic ring being fused to the imidazole ring through an adjacent ring substituent, and a cycloaromatic ring comprising at least about 6 carbon atoms, said cycloaromatic ring being fused to the imidazole ring through an adjacent ring substituent.

39. (Original) The method of claim 37, wherein the bisphenol which is being formed is 4,4'-isopropylidenediphenol.

40. (Original) The method of claim 37, wherein the aromatic hydroxy compound is phenol.

41. (Original) The method of claim 37, wherein the carbonyl containing compound is a ketone or an aldehyde.

42. (Original) The method of claim 41, wherein the ketone is acetone.

43. (Original) The method of claim 37, wherein said polymeric resin comprises at least one member selected from the group consisting of polystyrene, a zeolite, and silica.

44. (Original) The method of claim 43, wherein said polymeric resin further comprises divinylbenzene.

45. (Original) The method of claim 44, wherein the amount of divinylbenzene is up to about 12 percent based on the total weight of the polymeric resin.

46. (Original) The method of claim 37, wherein said protic acid functionality comprises at least one member selected from the group consisting of a sulfonic acid functionality, a phosphonic acid functionality, and a carboxylic acid functionality.

47. (Original) The method of claim 38, wherein the linking functionality X, is the same as the linking functionality Y.

48. (Cancelled)